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A PRECISE CRITERION OF SPECIES.

TO THE EDITOR OF SCIENCE: Your note in SCIENCE No. 178 on the recent paper by Dr. Davenport and Mr. Blankinship on a 'Precise Criterion of Species' raises a question which I think you do not follow to its necessary conclusion. That the criterion of species is a problem largely made up of psychological elements seems an almost self-evident proposition, and as I understand the paper in question its object is simply to tabulate these psychological elements and draw from them an exact statement of accepted current usage. From this tabulation it appears that in America, during the present decade, groups of animals whose differences may be expressed by one kind of curve are currently regarded as species, while those whose differences give another curve are looked upon as subspecies. But why should the question be left here? If the curves were made from data furnished by determinations current in America during the past decade or in Europe now they would be strikingly different from those actually obtained by Dr. Davenport. An almost equally noticeable discrepancy would occur between the curves furnished by the work of certain American and European systematists at the present day as compared with those of some of their respective compatriots.* Furthermore every individual worker passes through phases of opinion in each of which his work would give appreciably different curves. It appears to me, therefore, that Dr. Davenport and Mr. Blankinship have elaborated not so much a precise method of distinguishing between species and sub-species as for graphically representing the opinions of different times and individuals. In other words, they have shown how to make a Linnaeus-curve, a Brehm-curve, an America-curve or an 1898-curve—which when compared together have an undoubted psychological interest—but they have not furnished a criterion which will be of actual service to working systematic zoologists. The reason for this failure is partly, as Dr. Davenport suggests in his letter in SCIENCE No. 179, due to the complexity of the method, but more especially to the fact that systematists, from the

* I write from the standpoint of mammalogy and ornithology.

very nature of their work, must hold themselves ever ready to accept new points of view and new standards of value.

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SCIENTIFIC LITERATURE.

A Text-book of Entomology, including the Anatomy, Physiology, Embryology and Metamorphoses of Insects, for use in Agricultural and Technical Schools and Colleges, as well as by the working Entomologist. A. S. PACKARD. Macmillan Company, 1898. 8vo. Pp. 729. 654 figs.

Students of entomology who began their work some fifteen or twenty years ago often found Professor Packard's 'Guide to the Study of Insects' the only accessible American book of reference on the subject of general entomology. It was a large volume, containing much valuable material, but it never seemed to satisfy one even on minor questions. It contained anatomy, physiology, embryology and taxonomy in a somewhat undifferentiated condition. The redeeming feature of the work was the wide philosophical interest that its pages inspired. This interest had its source in Professor Packard's own industrious and enthusiastic study of the subject of entomology, a study which he has extended without interruption during the thirty years that have elapsed since the publication of the 'Guide.' The results of this long study now lie before us in this able text-book.

The recent publication of Comstock's 'Manual' and Sharp's volume on insects in the 'Cambridge Natural History' has evidently led Professor Packard to exclude a consideration of the taxonomy of insects and to confine his treatment to the morphological and physiological aspects of the subject—a task surely very great even as thus limited. He takes up in succession the anatomy, embryology and metamorphoses of insects, giving more or less attention to the physiological aspect as he proceeds. His presentation of this last aspect is, perhaps, the weakest portion of the book, because Professor Packard has not made special up-to-date studies in this field. He omits all mention of several interesting physiological facts, such as Professor J. Loeb's interesting experiments on the heliotropism and stereotropism of insects.